

What is Claimed is:

- 1 1. A computer-implemented method of automated software specification,
2 comprising:
 - 3 storing specification modules, with their relations displayed on a
4 computer screen in terms of their specification morphisms, where the specification
5 morphisms translate the specification signatures while preserving the logical structure of
6 the specification;
 - 7 determining and displaying, in response to a user command, multiple
8 specification diagrams, each of which captures the relation between two or more
9 specification modules, along with its specification morphisms;
 - 10 building and displaying, in response to a user command, a diagram of the
11 specification diagrams, the diagram of specification diagrams retaining the diagram
12 morphisms of the specification diagrams; and
 - 13 computing the colimits of the hereditary diagram of diagrams to
14 compose large software modules while preserving the decomposition of the involved
15 components.
- 16 2. A computer-implemented method for determining a colimit of a hereditary
17 diagram, comprising:
 - 18 extracting the shape colimit of the hereditary diagram stored in a
19 memory, the hereditary diagram including a plurality of diagrams;
 - 20 bringing each of the plurality of diagrams in the hereditary diagram to
21 the shape of the shape colimit to yield a plurality of extended diagrams in the memory;
22 and

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taking the colimit of the extended diagrams.

3. The method of claim 2, further comprising: receiving from the user an indication to find the colimit of the hereditary diagram.

4. The method of claim 2, wherein extracting the shape colimit of the hereditary diagram includes:
determining the shape of each of the plurality of diagrams to yield a shape graph in the memory; and
automatically calculating a colimit of the shape diagram.

5. The method of claim 2, further comprising: displaying a representation of the colimit on a display device.

6. The method of claim 5, wherein the representation of the colimit is the name of the colimit.

7. The method of claim 5, wherein the representation of the colimit is a picture of the diagram of the colimit.

8. The method of claim 2, wherein the hereditary diagram includes types of the diagram elements.

9. The method of claim 2, wherein the hereditary diagram includes morphisms between the diagram elements.

10. The method of claim 2, wherein the hereditary diagram is displayed with indicators on its arcs indicating what morphism is associated with the arcs.

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52 11. The method of claim 2, wherein the colimit of the hereditary diagram is
53 displayed with indicators on its arcs indicating that that arcs constitute a cocone colimit.
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55 12. A computer-implemented system of automated software specification,
56 comprising:

57 specification modules stored as separate entities, with their relations
58 displayed on a computer screen in terms of their specification morphisms, where the
59 specification morphisms translate the specification signatures while preserving the
60 logical structure of the specification;

61 a portion that determines and displays, in response to a user command,
62 multiple specification diagrams, each of which captures the relation between two or
63 more specification modules, along with its specification morphisms;

64 a portion that builds and displays, in response to a user command, a
65 diagram of the specification diagrams, the diagram of specification diagrams retaining
66 the diagram morphisms of the specification diagrams; and

67 a portion that computes the colimits of the hereditary diagram of
68 diagrams to compose large software modules while preserving the decomposition of the
69 involved components.